THE

YOUNG MECHANIC.

VOL. I. DECEMBER, 1832. No. XII.

OBSERVATIONS ON DRAWING INSTRUMENTS.

[Concluded from p. 162.]

SCALES.

THE Sector and Gunter's scales, being but seldom used in most kinds of drawing, it is not considered necessary to give a full and elaborate description of either. They are sometimes convenient in projecting different views of the sphere, and in dividing lines proportionally. As all cases of instruments generally contain the former, it will not perhaps be amiss for the student or artist to supply himself with one, especially if he is desirous of forming a complete collection; but, if otherwise, it will hardly repay him for purchasing it, and the same may be said in regard to the latter. Considering that very few instances occur in which these two scales are of use to the practical man, we shall confine ourselves more particularly to the plane and diagonal scales.

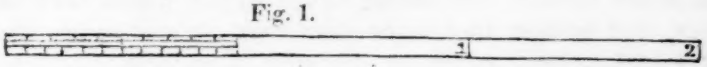
The *plane scale* (or scale of equal parts, as generally called,) is formed by dividing a given line into any number of parts or divisions, which bear a certain relation or proportion to the divisions of another given line, larger or smaller than the former. For instance, suppose we wish to make a length of three inches express on paper a line of three feet; it is evident that if we divide the three inches into three parts with our compasses, each of these parts will represent a foot or one third part of the first line. Thus if we subdivide each of these third parts into twelve parts, each of the parts so found will represent a twelfth part of a foot, or an inch; and we may take two, four, six or ten, or any number of inches, or parts of inches, and divide and subdivide them in the same manner, in any given ratio or proportion to another line. This will serve to explain fully the method of constructing this scale, which is used by the draftsman, and by the help of which he is enabled to lay out his plan in any proportion. As it would be extremely inconvenient and difficult to form a new scale on paper for every drawing which is made, various scales of inches and parts of inches are cut on a thin piece of ivory, which is denomina-

ted a *scale*, the best kind being about thirteen inches long, and having on them scales of two inches, 1 3-4, 1 1-2, 1 1-4, Inch, 3-4, 1-2, 1-3, 1-4, 1-5, 1-6, 1-7, 1-8, 1-9, 1-10, subdivided into tenths and twelfths, as in figure 1, the twelfths being in the lower line and the tenths in the upper. The smaller scale which is usually contained in the common cases of mathematical instruments, has a protractor on one side and a few scales on the other, but as this is a cheap article, we scarcely ever find them accurate, and as it is an instrument on which we place so much dependence, we cannot be too careful in our selection of it. A small error may not be perceived in transferring a few distances to paper, but in a large plan a succession of these small errors soon produces a very perceptible one, and we should be continually subjected to the alternative of erasing all we had done from the paper, and beginning anew, or of proportioning the error, as near as we can judge, among the different lines. In plotting field work, every thing depends on the accuracy of construction of the scale and protractor. When a rule is used, it should never be laid on the table or drawing board, and the compasses pressed upon it, as they are very liable to slip and thus scratch and deface the divisions, but it should be held in the left hand, and setting one leg of the compasses in the division which denotes one extremity of the line to be enclosed in them, allowing them to bear only by their own weight, the other leg is to be extended by the middle and fore fingers, so as to comprehend the intended distance. In this way, by careful usage, a scale may be made to last a great many years.

For surveyors, scales of about a foot in length, with both edges champered and graduated into tenths, twentieths, thirtieths, fortieths, &c. of an inch, are of great utility, as they may be laid on a line, and any distance pricked off from the edge, and when a number of distances are to be transferred in one continued line, it can be done much more accurately in this way than by the compasses. These scales generally come in setts of three, four or six, packed in a small case, which sometimes contains in addition a triangular piece of ivory, having a mark or marks on the hypothenusal side, the use of which is to convert the scales into a sort of parallel ruler, by which any number of lines may be drawn parallel and at very small distances from each other. Buildings or other objects or plans may be shaded in lines in a very regular and beautiful manner by it. To use it, one of the sides adjacent to the right angle is set against any line to which others are to be drawn parallel, as the side of a square for instance. The edge of one of the scales is then applied to the hypothenuse and a division brought to coincide with the mark on it. By confining the scale down upon the paper by the hand or otherwise, the triangle may be moved along its edge so as to bring the mark in contact with all the divisions, and in proportion as the triangle is slid from right to left, or the reverse, the edge against the side of the square recedes from it. A scale and two rulers opening on a joint like a sector, may be contrived in a similar manner to shade cylindrical, elliptical, parabolic, or any kind of curved surfaces. In order to do this,

suppose we have a rectangle on one plan which we wish to shade by lines, so as to represent a cylinder ; if we in the first place graduate the outside edge of one of the rulers according to the difference of the sines of the angles of a quadrant or semi-circle, the arcs of which have a due relation to the intensity of the shade on the surface of the cylinder, we can divide the surface of the rectangle in the same proportion, by applying the edge of the other ruler to the side of the rectangle, and bringing up to the graduated edge of the former, a scale which has a certain division on it denoted by a star or any mark sufficient to distinguish it from the others, (it will be perceived that the divisions are placed on one of the sectoral rulers so that they may be used against any straight edge having a divisional mark on it, thus forming the instrument complete in themselves) and opening the rulers so that when they are slid along till they meet the opposite side of the rectangle, the star mark shall correspond to the other extreme division of the graduations. As an instrument of this kind has never been noticed by any author it may be called a *sciagraph*.

Fig. 1.



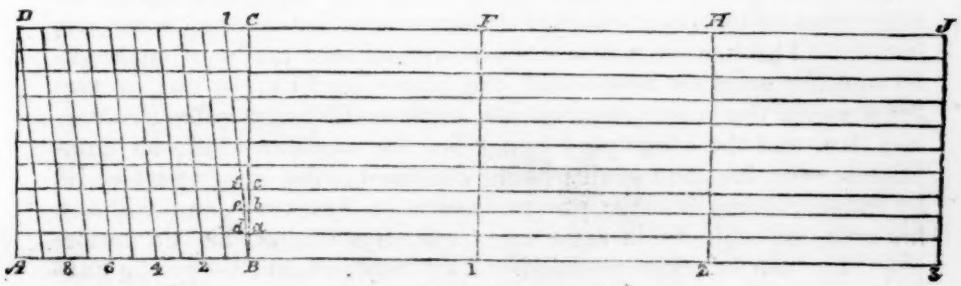


Fig. 2.

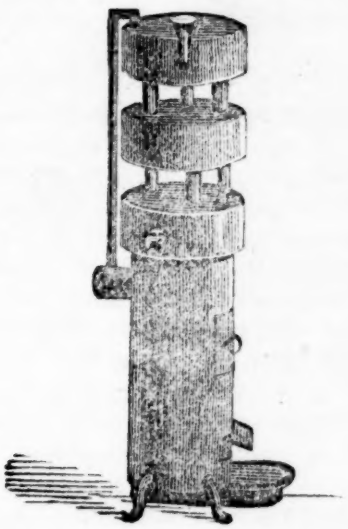
The Diagonal Scale.—No scale has as yet been constructed which exceeds in accuracy or simplicity this. By it an inch can be divided with ease into one thousand parts, and any measurements, to that degree of fineness, removed by the compasses to paper. To make it, we first take any line, A B, fig. 2, equal to 1-2, 1-3, 1-4, or any other fractional part of an inch, and erect upon it the square or rectangle A B C D. We then divide A B into four, six, eight, or ten equal parts, ten being generally used on the ivory scales. Having done this we likewise divide D C into the same number of parts, and A D and B C are to be divided similarly. Produce the line A B, making B 1 equal to A B=1-2=2-3. Draw through the points *a b c*, on the line B C, the lines *a d*, *b e*, &c. parallel to A B. Join the 0 point of the line A B to the point 1 on C D, by the line B 1 ; and draw the lines 1-2, 2-3, 3-4, &c. parallel to it, and the scale is complete. Now B C being divided into ten parts, and C 1 being 1-10 of D C=1-10 of A B, the triangles *d a* B, *e b* B, *f c* B, 1 C B, are similar, and their homologous sides pro-

portional; that is, B C : 1c :: B *a* : *d a* :: B *b* : *e b* :: B c : *f* c. But B *a*=1-10 B C and B *b*=2-10 B C and B *c*=3-10 B C, therefore *a d*=1-10 C 1=1-100 A B, *b e*=2-10 C 1=2-100 A B. Again, suppose we divide A B into eight parts and B C into four, six, or twelve parts, it is evident that we might thus get 1-32, 1-48, 1-96, or any other part of A B. Supposing the line A B to be the unit of the scale, if we wish to take a unit and a tenth, or two, three, &c. tenths, we have only to set one leg of the compasses on 1, and move the other leg to intercept any of the divisions of A B, according to the number of tenths to be taken. If units, tenths and hundreths are required, set one leg on 1 F, if one unit is wanted; if two or three, on 2 H or 3 J, and move upwards to the first, second, third or fourth parallel, according to the number of hundreths. Extend the other leg to the intersection of the line B 1 with the assumed parallel, and the number of units, and hundreths is contained in the points of the compasses, and by extending it still farther on the same parallel, you may take in any number of tenths. It is on these principles that all the diagonal scales are formed, but owing to the space which they take on the ivory, we seldom find more than four on any scale, these giving the 1-100, 2-100, 3-100, 4-100 parts of an inch.

In conclusion, a few observations may not be amiss upon the *magazines* or cases in which the instruments are packed when not in use. The boxes for this purpose are usually made of mahogany or other suitable hard wood, the larger sort having one or two drawers for the larger instruments, such as *Elipsagraphs*, *Protractors*, &c. and the other part being for the smaller kind, as compasses, pins, &c., the scales being confined in the upper part or lid by small buttons or other proper fixtures. As every one will suit his own convenience in regard to form, dimensions, &c. no particular plan can be recommended. The inside should always be covered with soft velvet or cloth, and divided by small partitions for the different instruments, which should never be thrown into a box or drawer promiscuously by themselves, as they are very apt when lying together in this manner to abstract moisture, and soon become oxidated. Before the steel drawing pens and other instruments are laid away, they should be very carefully freed from all ink or perspiration which may adhere to them. The box when not in use, ought always to be closed, that the dust may not collect on the instruments and get into the joints, causing them to wear loose and uneven. Care should be taken to keep the scales separate from the other instruments, that they may not be scratched or defaced.

Having finished this subject, the writer may at some future period extend his remarks to Plain Drawing. R. H. E.

FESSENDEN'S STEAM STOVE.



THE principles of this invention consist in forming an easily *portable apparatus*, which furnishes convenient modes of arresting and detaining much of that heat produced by fire for warming apartments, which in common stoves is suffered to escape through the smoke pipe and chimney. This is effected by exposing as large surfaces of water, inclosed in proper metallic vessels, as is conveniently practicable to the action of the heat of the fire-place, distributing the caloric, thus detained, within the apartment to be warmed, and condensing and bringing to the boiler, the steam thus arising, without the apparatus of valves, syphons, &c. &c. heretofore thought indispensable in heating by steam.

The apparatus which constitutes my Steam and Hot-water Stove, consists of a hollow cylinder, standing perpendicularly on short legs. Within this cylinder are a grate, an ash-pit, and a fire-place, with proper doors to admit fuel, take away ashes, &c. Directly over the fire place, and also within the cylinder, is a boiler; and over the boiler two or more flat cylindrical vessels, (as represented above,) fitted with tubes to receive steam from the boiler, and yield heat to the air of the room. The tubes forming the channels of communication between the boiler and the receivers, terminate within the latter, two or three inches above their bottoms; by which means water is retained in the lower parts of the receivers, while their upper parts are heated by steam. The extra steam not condensed in the receivers is carried off by a small tube leading into the smoke pipe.

Although I have adopted, for the most part, in my Patent Stove, apparatus, similar in shape and component parts to that figured and described above, yet its form and proportions may be varied indefinitely. And as the Patent Act declares that 'changing the

form and proportions of any machine in any degree shall not be deemed a discovery,' I shall hold the unlicensed adoption of the *principles* of my stove, under any possible form or modification, to be a violation of my patent right.

Directions for using the Apparatus.

In putting the stove in operation, it is necessary, before kindling the fire, to turn water into the tunnel at top till it fills the boiler and will run out at the cock, and a quart or two more, as an allowance for waste. The cock answers as a guage to ascertain when there is a sufficient quantity of water in the apparatus ; and when there is much fire kept in the stove the cock should be turned several times a day, and if no water escapes, more should be turned into the tunnel. But the receiver in which the cock is placed should never be filled quite full, for in that case the water in boiling comes in violent contact with the top part of that receiver, and not only makes a disagreeable noise, but strains and endangers the vessel in which the ebullition takes place.

The above is the Inventor's account of the stove. In a pamphlet published by him there is a number of recommendations from gentlemen of respectability, who speak of it as a valuable invention. That some of the heat must be arrested, and conveyed to the room by means of the water and steam, instead of passing up the flue, appears evident. The quality of the heat also must be influenced by the heat of the surface to which the air of the room is exposed. For example, the air exposed to the surface of a vessel containing water and steam at 212°, is better for breathing than the air exposed to a red-hot cast iron stove. The only difficulty that we know of, is, that the tin vessels heretofore used are not so durable as might be desired, and it is probable the inventor cannot perfect his stove without using cast iron vessels.—EDS.

PATENTS FOR MASSACHUSETTS,

GRANTED IN MAY, 1832.

For a machine for *Making Coopers' Rivets* from iron, copper, or other metal ; George W. Soule, New Bedford, Bristol county, Massachusetts, May 11.

The heated metal which is to be made into rivets is passed between two iron rollers, grooved so as to reduce it to the size of the shank of the rivets, and the metal is received by an apparatus which cuts off and heads it. From the nature of the machinery its description would require drawings to make it understood. The claim is to every part of the machine, with the exception of the grooved rollers. The description, as given, is obscure, and the drawings themselves are not well executed.

For *Paper for covering Buildings;* Frederick A Taft, Dedham, Norfolk county, Massachusetts, May 11.

Paper is to be made by taking finely ground coal and sulphur, and mixing it intimately with the pulp, after which the sheets are formed in the usual way. After the paper has been dried it is to be passed between heated rollers, which will melt the sulphur and render the paper impervious to water. Other materials are to be sometimes employed for the same purpose, and the paper, instead of being rolled, may be pressed between heated plates, or put into an oven.

The proportionate quantities of the materials employed, may be one part, in weight, of fibrous stock, two and a half of brimstone, and two of coal. Salt and lime are sometimes added, to render the whole less combustible.

For an improvement in *Andirons;* William Wilson, Greenfield, Franklin county, Massachusetts, May 16.

In this andiron, the front or upright part, and the bar and back foot part, are made separate. They are to be put together by means of a wedge-formed dovetail on the front end of the bar, which falls into a corresponding recess formed by projecting cheeks on the back of the upright part.

The advantages of this mode of forming are said to be facility of packing; more easy manufacturing; increased strength, and economy in use, especially when made of cast iron, as one part can be renewed when the other is broken or burnt out.

BOTTOMLESS PRIVIES.

MESSRS. EDITORS—All persons who love pure water, should examine their privies and ascertain if they are without tight bottoms. If they are, the strong probability is, that the wells, in the immediate vicinity, are in some degree tainted. One gentleman in this city, (who is an extensive owner of real estate,) informed me that one of his vaults had not been emptied for six years, although it had been, during this time, in constant use. There being no artificial bottom to this vault, the fluid contents had filtered away, through the soil, as fast as they had been put in. But as there was no well so near as the neighboring cellars, the latter places received the *pure* and *healthy* streams from this *underflowing* fountain. I can point to a number of vaults in this city, (and I presume there are hundreds,) without any bottoms, except the natural soil: and this is in many instances extremely porous. It seems to me, Messrs. Editors, that this method of constructing privies is an evil of sufficient magnitude, to deserve the attention of municipal legislation.

Yours Respectfully,

BOTTOM.

From the Journal of the Franklin Institute.

COATING LEAD PIPES.

Specification of a patent for Coating Lead Pipes with Tin. Granted to Thomas Ewbank, city of New-York, May 18, 1832.

To all whom it may concern, be it known, that I, Thomas Ewbank, of the city of New-York, have invented a mode of coating lead pipes with tin, in a more effectual manner than has been heretofore done, and by which the danger attending the use of such pipes for the conveyance of water, and other liquids, is obviated, whilst their cost is but little enhanced ; and that the following is a full and exact description of my said invention.

I take the lead pipes, *after they have been drawn to the required size*, and I coat them with tin, either on both sides, or on the inside only, as may he desired. To do this I prepare a bath of melted tin, in a vessel of a suitable form and size, which may vary according to the size of the pipe to be tinned. I regulate the heat of this bath, so that the tin shall continue in a fused state, without becoming sufficiently heated to melt the lead. This may be ascertained either by the use of a thermometer, or by testing it by a piece of lead, or by such a mixture of lead and tin as will fuse at a given temperature : with a little experience, however, a workman will not find any difficulty in accomplishing this object without such aids. When the pipe is to be tinned on the inside only, I cover the outside with lampblack and size, or with any other article which will prevent the action of the tin upon it : I then blow powdered rosin into the pipe. When it is to be tinned on both sides, the rosin is to be blown, or otherwise passed into the pipe, and the outside also is to be sprinkled with it, and it is then ready for the process.

The melted tin should be kept covered with rosin, fat, or other suitable article, to prevent its oxidation, and to aid in the tinning. All that is necessary is then to pass the pipe through the melted tin, which, when the pieces are not of considerable length, may be easily managed by hand ; or when of considerable length and weight, a rope and pulley, or any other suitable mechanical contrivance which the workmen may prefer, may be resorted to.

I am aware that the coating of lead pipes with tin, simply, is not new, the same having been heretofore done, but in a manner less perfect than that which I have just described. The lead has been tinned in sheets, and afterwards made into pipes, or the pipes have been made and tinned, and afterwards drawn to the intended size. By neither of these processes, however, is the intended security obtained with the same certainty as by my process of tinning the pipes *after* they are otherwise finished. The coating of tin is thus rendered more perfect, and those fissures are avoided which the former processes can scarcely fail to produce

I do not therefore claim as my invention the mere tinning of pipes, made out of lead, but what I do claim is the tinning such pipes after they have been drawn to the proper size, as is hereinbefore set forth. THOMAS EWBANK.

From the Register of Arts.

PROPELLING VESSELS.

Patent to W. Hale, Machinist, for improvements in machinery for Propelling Vessels, granted Oct. 13, 1831.

THE improvements in propelling proposed by Mr. Hale, consist in driving water forcibly out at the stern of the vessel under the water line, by means of a rotatory apparatus, somewhat similar to the rotatory blowing and winnowing machines.

In the 5th volume of the present series of the Register of Arts, p. 67, we have given a description of a patented invention of Mr. William Hale, for raising or forcing water for propelling vessels, and the present patent has been taken out for a modification of the same method, therefore we refer our readers to the former description to obtain a general idea of the plan.

In his second patent Mr. Hale makes the exterior casing of the paddle box to recede from the centre spirally, constituting a curve whose distance from the centre of motion at its outer extremity exceeds the distance at its inner extremity by the space or opening made for the escape of the water from the box. The water is admitted into the box through openings near the center, in the manner usually adopted for the supply of air to the blowing machines. The propellor, or vane, which puts the water in motion through the medium of a steam engine, or other first mover, consists of a single lever receding spirally from the axis, or centre of motion. The motion of the vane is in the direction to cause the water within the box to recede from the centre, and escape finally in a direction which is a tangent to the curve ; or its motion is towards its back, or that part farthest from the centre. The patentee does not however confine himself to the spirally formed vane, but proposes several other modifications of the moving or propelling part of his invention ; such as placing a series of oblique paddles or propellors on arms extending from the centre of the apparatus, as in his former patent : and these he again proposes to vary, according to circumstances, in number, magnitude and position.

This propelling apparatus is placed near the stem of the vessel with the axis in a vertical position, and the opening at the circumference of the paddle box made to communicate with the water in which the vessel floats through an opening in the stern, while the openings near the centre of the box are made to communicate with the exterior water through the bottom of the vessel.

The application of the invention to raising or forcing water, is effected by connecting the induction openings with the well or reservoir from which the water is to be raised, and a delivery pipe with the eduction opening, and thus the machine becomes a rotatory pump.

MESSRS. EDITORS,—A part of my answer, in your last number, was so erroneously printed, as to be quite unintelligible. Will you please insert the following?

A 9,25 3-4, B 10,58, C 6,61 1-4. A and B did 3-4 of the work. C 1-4 or 5-20. B and C did 13-20, therefore B did 8-20, and A the remaining 7-20. A and C did 6-10, and not 9-10, as stated in the question.

According to Mr. Tenney's answer, A and B did 15-23 of the work, A and C 18-23, B and C 13-23, which fractions, when reduced to a common denominator with 3-4, 9-10, and 13-20, will not be found equivalent with them, as they ought to be, to meet the requisitions of the question.

R. S.

The form which contained this answer went to press without the particular inspection of the person who has charge of the questions, on account of his indisposition. We shall be more particular hereafter.—EDS.

NOTICE TO CORRESPONDENTS.

The answer of 'No Schoolmaster' is received, but was mislaid until too late for this number. Cymro's Formula is under consideration. J. R. C.'s communication will probably appear in our next. J. H. B. will please to send the first part of his proposed series by the 1st of January. J. M. W.'s reply to Philo is too late for this number. We regret this, as it would have been better to complete the controversy in the present volume. The question of C. will appear in our next.

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